Aluminum Bright Dip Process Gives Low Cost Reflectivity

By F. H. HESCH
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Research Engineers
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Reprinted from
WESTERN METALS
December, 1950

KAISER ALUMINUM & CHEMICAL SALES, INC.
PALMOLIVE BLDG., CHICAGO, ILL.

FINISHING

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FOUR years ago the aluminum industry began a search for an economical method for brightening aluminum alloys. The division of metallurgical research of Kaiser Aluminum & Chemical Corporation at Spokane entered the hunt and has come up with a new process termed Kaiser aluminum bright dip.

The development of this process followed many months of experimentation. After the discovery of a solution made up of simple inexpensive constituents, individual samples of high purity aluminum and alloys 2S, 3S, 52S, 61S, and 150S were tested in it. Some samples were first dipped in the solution at room temperature, and the temperature then increased to boiling.

Other samples of the same alloys were tested at each 10° rise in temperature. This procedure was repeated with 25 separate additions of each active constituent of the solution. The time of dipping was also varied from one to 20 min, in 1-min intervals, with each set of conditions.

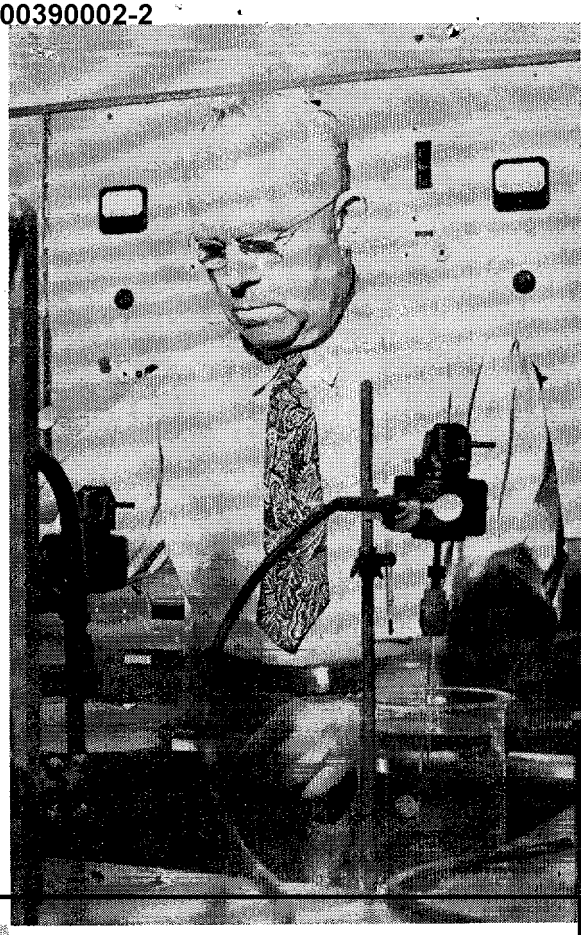
While aluminum has a high total reflectivity, the problem which faces aluminum finishers has been the raising of its specular reflectance. Early methods for increasing this reflectivity were buffing and, later, electro-polishing and electro-brightening. Buffing is expensive in time and equipment, while being difficult on pieces of intricate design. Electro-polishing and electro-brightening are expensive in both equipment and maintenance. However, these methods are in wide use today and serve well in some instances.

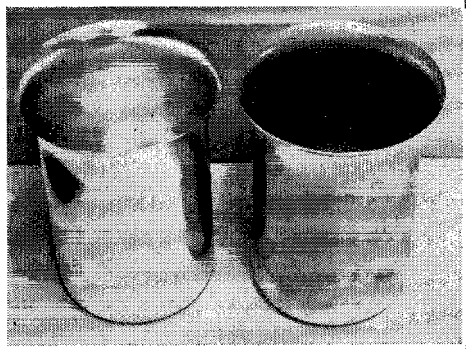
The bright dip process can be used on all aluminum alloys, but the most satisfactory brightening can be obtained on alloys, 2S, 3S, 52S, 61S, 150S, and high purity aluminum as well as on the clad forms of 24S and 75S. Uses in this wide range include:

1. Brightening pieces for anodizing.
2. Increasing the reflectivity of buffed sheet.
3. Treating pieces before zincating.
4. Removing the hard aluminum oxide film before buffing.
5. Stripping anodic film from aluminum.

This process develops a reflectivity comparable to buffed silver on some alloys when they have been buffed prior to dipping. The bath eliminates impurities on the surface, thus giving a bright base for anodizing and assuring a clear even coloring after dyeing.

It also preferentially attacks high spots on the surface, reducing rollmarks and

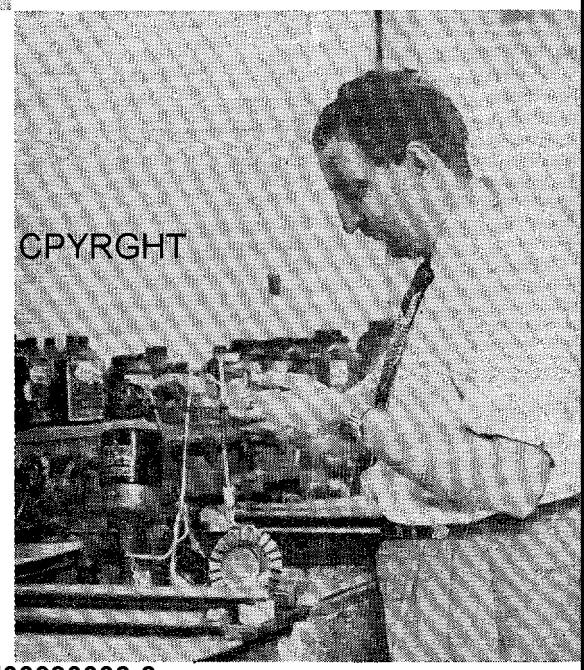




ABOVE—F. H. Hesch makes a test in his laboratory at Kaiser Aluminum & Chemical Corp.'s division of metallurgical research.

LEFT—The deep drawn aluminum container on left received the bright dip treatment. Note contrast in brightness between two.

BELOW—C. A. Rosellen bright-dips sample ash trays during the experiments which developed economical brightening method.



minor scratches which may result from production or handling. The smoothing action of the bath also prepares the surface for pre-plate zincating so that a thin transparent film of zinc may be applied to it. Platers have found that the most adherent plating bond results from a thin zinc coat.

A further advantage is a low viscosity, which reduces the damages of pitting and gas tracks frequently found on brightened aluminum. The low viscosity permits the gas to escape freely without marring the surface and decreases the cost in bath lost during rinsing, since very little bath clings to the surface when it is removed from the tanks.

Low acid concentrations permit the use of AISI type 347 stainless steel finishing tanks and reduce greatly the amount of fume given off during operation. However, even at boiling temperatures, this bath does not give off obnoxious fumes.

Surfaces are cleaned before bright-dipping by the use of a metal washing machine or a vapor degreaser. They are then dipped for one to five min in the solution and rinsed in cold water. In cases where extremely high specular reflectivity is desired, the material should be dipped, buffed, cleaned in a non-etching cleaner, and rinsed in cold water before proceeding with the regular process. A nitric acid solution is used as a 10-sec dip to remove smut after bright-dipping of buffed material.

When the pieces are removed from the last water rinse they are ready for immediate anodizing or zincating. This should be done without delay since the surface is left highly active chemically and susceptible to finger and handling soil. However, if the pieces are suspended from racks and allowed to age in air for a few days, a natural oxide film will form on the surface, making them as safe to handle as ordinary aluminum. Lacquering may be done as soon as the pieces have dried after the final rinse.

This process can be used on aluminum products for both interior and exterior applications. Interior products may include electrical appliances, water tumblers, kitchen and sewing racks, and wall fixtures. It may also be used on refrigerator compartment doors, ice cube trays and shelves, or anywhere a bright dyed or clear anodizing surface is desired.

Out-door applications may be for such uses as truck, train, boat, and aircraft bodies, architectural trim and decorative patterns, and for bright metal trim on automobiles.

Manufacturers and artisans in artistic fields—costume jewelry, vases, desk furnishings, etc.—may also find it of value in heightening appeal of their product.

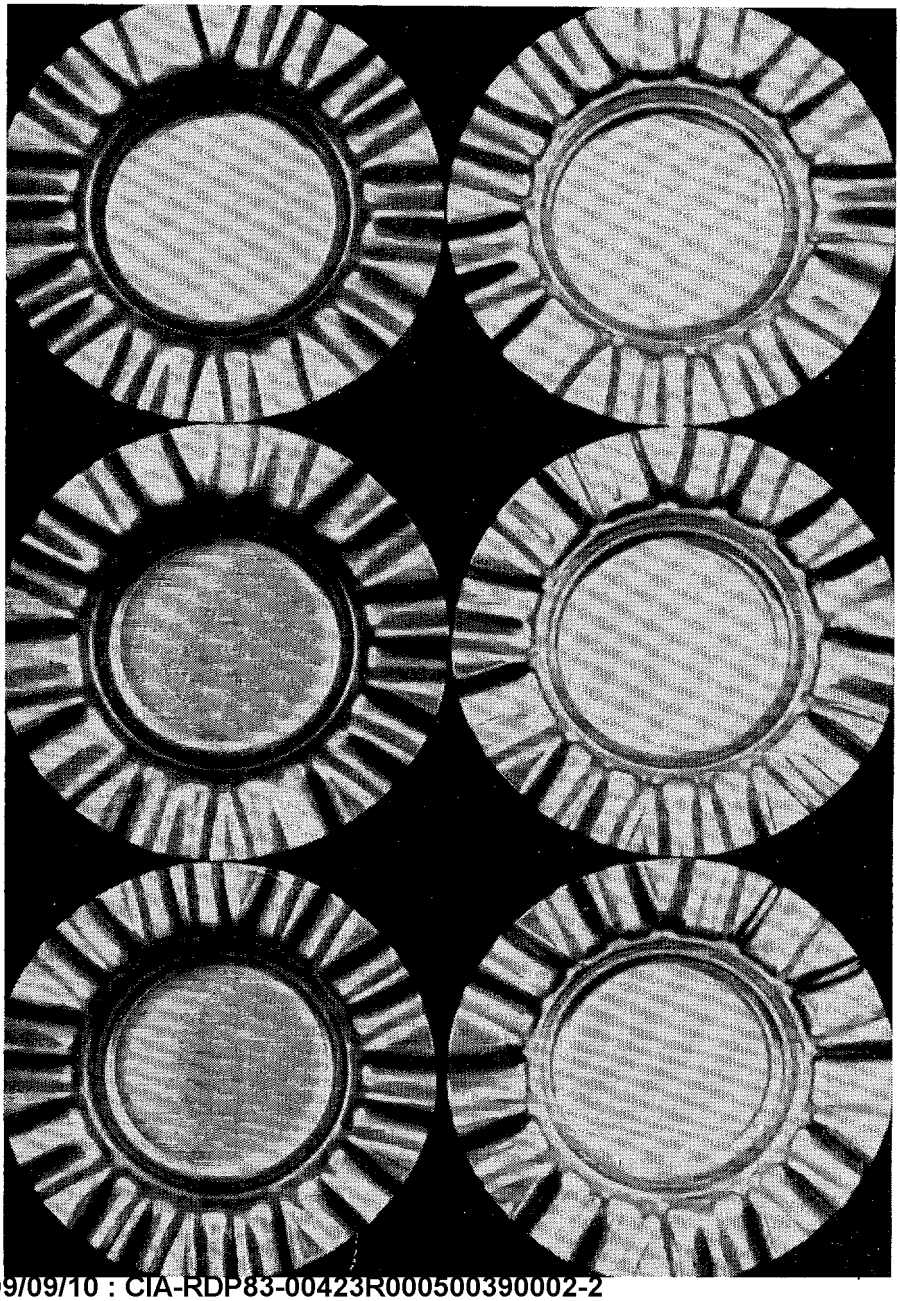
Since most dyes used to color anodized aluminum surfaces today have a tendency to fade in strong sunlight, it is recommended that they be used only for indoor products. Bright-dipped surfaces, lacquered or anodized and uncolored, will resist weathering and give best results for outdoor applications.

This process will be made available to aluminum fabricators under a license arrangement.

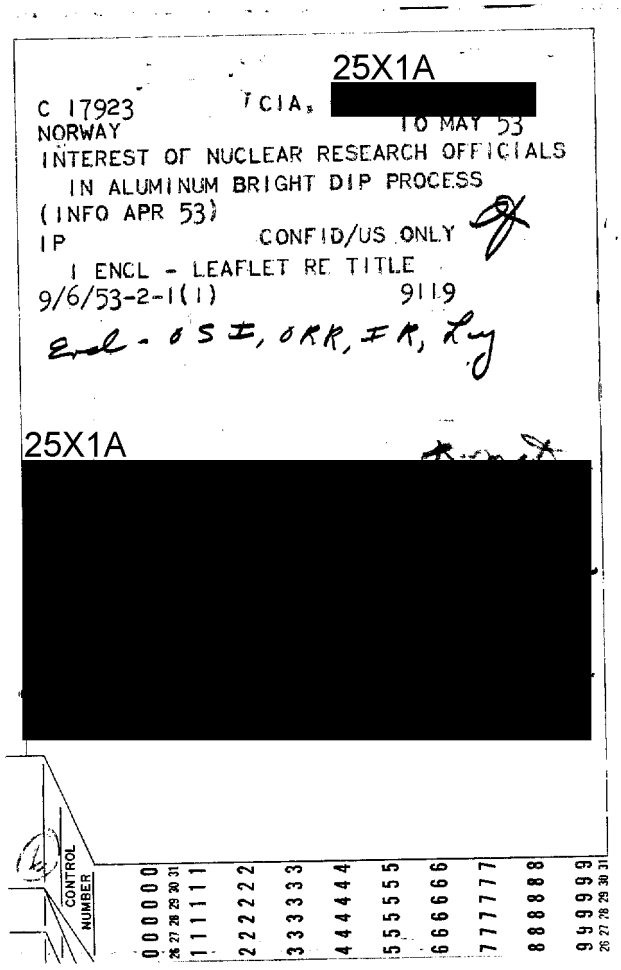
F. H. Hesch and C. A. Rosellen are research engineers in the metal finishing section of Kaiser Aluminum & Chemical Corporation's division of metallurgical research at Spokane, Wash.

Mr. Hesch studied at Carnegie Institute of Technology and University of Michigan. He has worked in chemistry, metallurgy, or metal finishing for Bell Aircraft, Reynolds Metal Co., General Motors, and Airesearch, in Los Angeles and for Standard Oil Co. of California in El Segundo, Calif. He has been with Kaiser metallurgical research for three years.

Mr. Rossellen studied chemical engineering at University of Wisconsin, and before joining Kaiser metallurgical research two and a half years ago had worked with Anaconda Copper Mining Co. at Great Falls, Montana.



THE mill-rolled aluminum drawn ash trays on the left were not finished. Those on the right were given the bright-dip process. Note difference in brightness and reflectivity between these two groups. These trays were a part of the research which led to development of this finishing process.



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